

C. Remarks

The claims are 4, 5, 9, and 16, with claims 4 and 5 being independent. The independent claims have been amended to further clarify the invention. Support for this amendment may be found in the specification at page 49, lines 16-23. No new matter has been added. Reconsideration of the claims is respectfully requested.

Claims 4, 5, 9, and 16 stand rejected under 35 U.S.C. § 112, first and second paragraph, for allegedly failing to satisfy the written description requirement and being indefinite. Specifically, the Examiner alleged that the specification as filed does not support the recitation of a first layer that is not less than 15 μm thick.

To expedite prosecution, and without acquiescence, claims 4 and 5 have been amended to delete the recitation of the thicknesses of the layers. Therefore, these rejections are moot and should be withdrawn.

Claims 4, 5, 9, and 16 stand rejected under 35 U.S.C. § 103(a) as being allegedly obvious from U.S. Patent Application Publication No. 2004/0070643 A1 (Kubota) in view of U.S. Patent No. 6,461,798 (Ohkuma). These claims also stand rejected under the judicially created doctrine of obviousness-type double patenting over the claims that issued in Kubota (U.S. Patent No. 6,951,380 B2) in view of Ohkuma. The grounds of rejection are respectfully traversed.

Prior to addressing the merits of rejection, Applicants would like to briefly review some of the features and advantages of the presently claimed invention. That invention, in pertinent part, is related to a method for manufacturing a liquid discharge head with a liquid passage. This method includes a step of providing a first polymethyl isopropenyl ketone (PMIPK) containing layer, and a step of providing, on the first layer, a

second layer including a photosensitive material of a copolymer obtained by copolymerization of a methacrylate and a methacrylic acid or anhydride (PMMA). The desired pattern from the second layer is formed by exposing a part of the second layer and removing the exposed part using a developing solution. The desired pattern from the first layer is formed by exposing a part of the first layer and removing the exposed part using a developing solution. Then, a coating layer is provided to coat the mold, and the mold is finally removed to form the liquid passage.

Importantly, the second layer is baked at a temperature of 100 to 150°C after being applied onto the first layer and is, therefore, not positively subjected to thermal cross-linked. Because the polymer is composed of a material having a larger weight average molecular weight (for instance not less than 50,000 in the case of the copolymer in claim 4), the desirable shape of the head after patterning can be maintained even if the second layer is not positively subjected to thermal cross-linking. Thus, according to the claimed invention, the average molecular weight of the copolymer and the baking temperature of the second layer can be controlled in addition to the first layer so that a very reliable liquid discharge head can be provided.

Kubota is related to a method of manufacturing a microstructure and a liquid discharge head. Kubota, however, discloses forming PMIPK and PMMA containing layers in the opposite arrangement from that presently claimed. However, the Examiner has alleged that Ohkuma teaches that using a PMIPK resist to form a mold for an ink pathway is an efficient process, and that it would, therefore, have been obvious to use this PMIPK layer as the first layer in Kubota. Applicants respectfully disagree.

Applicants respectfully submit that the polymer compound in Ohkuma used as the photosensitive layer is not PMIPK, but a copolymer linkable to PMIPK (col. 8, lines 12-45). Thus, the advantages to which the Examiner alluded in Ohkuma are not attributed to the layer used in Kubota as the second layer. Accordingly, Ohkuma does not suggest reversing the PMIPK and PMMA containing layers in Kubota.

Furthermore, neither reference discloses or suggests baking the second layer at the claimed temperature. Ohkuma is silent with respect to a PMMA-containing layer. Kubota teaches initiating a thermal cross-linking reaction in the positive resist layer 32 (the first layer including PMMA) by baking it preferably at 160 to 220°C, and the embodiments in Kubota show that the baking is conducted at 200°C (paragraph [0058]). To the contrary, as discussed above, the PMMA-containing layer in accordance with the present invention is baked at 100 to 150°C so that it is not positively subjected to thermal cross-linking. Thus, Kubota teaches away from lowering the baking temperature of the PMMA-containing layer to the presently claimed range as it would not lead to the thermal cross-linking desired in this reference.

Applicants respectfully submit that it is also not obvious from Kubota that the copolymer has the weight average molecular weight as claimed. The Examiner cited paragraph [0053] in Kubota for this teaching. Paragraph [0053] in Kubota, however, refers to the average molecular weight rather than the weight average molecular weight of the copolymer as recited in the present claims. Kubota mentions, at paragraph [0103], that a material of the cross-linking positive resist layer 203, which is a copolymer of methyl methacrylate and methacrylic acid (represented by P(MMA-MAA)) in a ratio of 90:10, has

a weight average molecular weight (Mw) of 33,000. This is well below 50,000 recited in claim 4.

The double patenting rejection is based on a substantially the same premise as the above-discussed obviousness rejection. Therefore, Applicants respectfully submit that it cannot be maintained at least for the same reasons as those discussed above with respect to the obviousness rejection.

Wherefore, withdrawal of the outstanding rejections and passage of the application to issue are respectfully requested.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

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